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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>7</sup> : <b>H04Q 7/00</b>	A2	(11) International Publication Number: <b>WO 00/45611</b> (43) International Publication Date: <b>3 August 2000 (03.08.00)</b>
(21) International Application Number: <b>PCT/SE00/00071</b>		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
(22) International Filing Date: <b>14 January 2000 (14.01.00)</b>		
(30) Priority Data: <b>09/241,366 29 January 1999 (29.01.99) US</b>		
(71) Applicant: <b>TELEFONAKTIEBOLAGET LM ERICSSON (publ) [SE/SE]; S-126 25 Stockholm (SE)</b>		
(72) Inventors: <b>HOUDE, Michel; 1570 Filion, Ville St-Laurent, Quebec H4L 4E8 (CA). ROCHEFORT, Steven; 89 Charles, Pointe Claire, Quebec H9R 4L2 (CA). LARSON, Dave; 506 Pebble Creek Drive, Cary, NC 27511 (US). PAULHOUS, Francois; 3070 Workman, App. 1, Montreal, Quebec H4C 1N3 (CA).</b>		
(74) Agent: <b>ERICSSON RADIO SYSTEMS AB; Common Patent Department, Klas, Norin, S-164 80 Stockholm (SE)</b>		

(54) Title: **HANDLING OF A DIGITAL WIRELESS OFFICE SYSTEM USER PROFILE**

## (57) Abstract

A method and system for retrieving at least one selected profile of a plurality of available subscriber profiles associated with a particular mobile subscriber and/or mobile station (16). After detecting a mobile station in a serving exchange (20), a specific one of the plurality of subscriber profiles is selected, and a message (34, 42) encoded with a request specifying the selected profile is sent to a remote database (28) that stores the plurality of subscriber profiles. The selected profile (38, 46) is retrieved at the database and is sent to the serving exchange for use in handling the mobile station.

## Published

*Without international search report and to be republished upon receipt of that report.*

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## HANDLING OF A DIGITAL WIRELESS OFFICE SYSTEM USER PROFILE

### 5 BACKGROUND OF THE INVENTION

#### Technical Field of the Invention

The present invention relates to a method and system for retrieving user profiles in a telecommunications network, and in particular for retrieving a private user profile for use in a wireless office system.

#### 10 Description of Related Art

In a mobile telecommunications network, a user profile for each mobile station user is stored in a home location register (HLR) associated with the particular mobile station. The profile typically includes an identification of the various services to which the mobile station owner has subscribed and a list of user preferences or mobile station characteristics. As the mobile station moves through the network, the user profile is retrieved from the HLR by the currently serving exchange.

15 Normally, a mobile subscriber has only one profile that is associated with his mobile station, and that profile is stored in the HLR of the public wireless system. Whenever the mobile station moves out of its predefined home area and into an area that is served by a different exchange, the visited exchange retrieves the subscriber's profile from the HLR for use in handling the subscriber's mobile station and in processing calls directed toward the mobile station and calls originating from the mobile station.

20 This retrieval process is used for normal roaming operations in public cellular networks and also used when the mobile station moves into a Digital Wireless Office System (DWOS). A DWOS is a private wireless system that is typically for use by a single business' employees in a limited area (e.g., in and around the place of business). Upon entry into an area covered by a DWOS, the subscriber's public profile is retrieved from the HLR associated with the subscriber. The public profile is then used in a manner similar to that with the public wireless network for handling the mobile station while it is located within the DWOS. In many cases, however, the

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DWOS service features differ from those provided in the public network, and the subscriber preferences and other data stored in the public profile may relate only to the service features of the public wireless network. Thus, the DWOS inherits the attributes of the public profile, even when those attributes are not entirely compatible with or applicable in the DWOS. In addition, the subscriber is not able to customize his or her preferences depending on whether the mobile station is being served by a public network or a DWOS.

Although the existence of multiple service profiles has been previously suggested in pending patent application Serial No. 08/977,455 entitled "Multiple Subscriber Service Profiles Per Mobile Station in a Cellular Communication System," such service profiles are not selectable depending on the particular serving network and do not provide for selection of particular subscriber profiles in response to a specified parameter.

There is a need, therefore, for a method and system for storing and retrieving one or more private profiles that relate to the specific service features of one or more public or private networks. Preferably, a private profile could also be passed around to other DWOSs in case the mobile station subscriber roams into another DWOS. Such a system would allow multiple subscriber profiles that are each custom designed for a particular wireless system or set of wireless systems.

## 20 SUMMARY OF THE INVENTION

The present invention comprises a method and system for selecting and retrieving at least one subscriber profile in a telecommunications network. When a mobile station registers in a particular network or exchange or at any other time when it is necessary to obtain and/or validate one or more subscriber profiles, a node of the network or exchange sends a request message to a node in the same or a different network. The request message specifies which of a plurality of subscriber profiles is needed. Generally, the selection of a particular subscriber profile is performed at the mobile station, serving exchange, or serving network according to the capabilities and characteristics of the serving exchange or serving network.

In a preferred embodiment, the request message is transmitted from a visitor location register (VLR) of the serving exchange to a home location register (HLR) or

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other node associated with the mobile station. The request message includes a Private Profile Request parameter or other parameter designated for identifying the requested profile. The HLR or other node that receives the request message retrieves the selected profile in accordance with the profile parameter, and returns the corresponding selected profile to the requesting node in a response message. The selected profile is thereafter used for handling the provision of services to the mobile station within the serving network.

The system and method of the invention allows multiple subscriber profiles to be stored at a centralized register and selectively retrieved depending on the type, identity, characteristics, or capabilities of the serving exchange or network. For example, a private profile can be stored in a subscriber's HLR and retrieved when the mobile station moves into a digital wireless office system or other private network. In addition, the same or a different private profile can be retrieved when the mobile station is being served by a second digital wireless office system. When the mobile station is in a public network, in the other hand, the subscriber's public profile or one of a plurality of public profiles is retrieved for use by the serving exchange.

#### BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention, reference is made to the following detailed description taken in conjunction with the accompanying drawings wherein:

FIGURE 1 is a block diagram of a multiple network wireless telecommunications system in accordance with the present invention; and

FIGURE 2 is a flow diagram illustrating the operation and signaling of the telecommunications system of the present invention.

#### DETAILED DESCRIPTION OF THE INVENTION

Referring now to FIGURE 1, there is illustrated a block diagram of a multiple network wireless telecommunications system 2 in accordance with the present invention. The system 2 includes a public land mobile network (PLMN) 10, a public switched telephone network (PSTN) 12, a first Digital Wireless Office System (DWOS1) 14(1), and a second Digital Wireless Office System (DWOS2) 14(2). These

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various networks are for purposes of illustration only and are not all required by the invention; rather, the invention is applicable in systems that include any number of public and/or private networks. In contrast to the PLMN 10, which is a public network that covers large geographical areas, the DWOSs 14 are private networks that normally have limited geographical coverage, although it is possible to have a DWOS that covers a relatively large area.

In the PLMN 10 and DWOSs 14, a subscriber mobile station 16 communicates via an air interface 24 with one of a plurality of base stations (BSs) 18 in the PLMN 10 or DWOS 14. The base stations 18 are connected to and are controlled by a mobile switching center (MSC) 20, which is used for routing calls via trunk connections 22. The PLMN 10 generally includes a plurality of MSCs 20 and at least one gateway mobile switching center (GMSC) 21 for connecting the PLMN 10 to the PSTN 12. Thus, although only two MSCs 20 are illustrated, it will be understood that a PLMN 10 typically includes numerous MSCs 20. Depending on the geographical coverage of a particular DWOS 14 and the number of base stations 18 that it includes, the DWOSs 14 can include one or more MSCs 20 that are also interconnected with the PSTN 12 via trunk connections 22.

When a subscriber mobile station 16 travels into a particular area and registers with a particular base station 18 in the PLMN 10, the MSC 20 associated with that base station 18 in the PLMN 10 retrieves information about the subscriber by sending a request to a visitor location register (VLR) 26 that is connected to the MSC 20. The VLR 26, assuming that it does not already contain the requested information, forwards the request (as indicated at 34) to a home location register (HLR) 28 via a signaling link 30. The HLR 28 contains information about the subscriber, including subscriber profile data and current subscriber location data, and in most cases is located in or associated with the PLMN 10. The HLR 28 can be located, however, in any node in the telecommunications system 2.

In a preferred embodiment, the request 34 that is sent from the MSC 20 to the VLR 26 and forwarded to the HLR 28 is formatted in accordance with ANSI-41 standards and can include a Qualification Request (QUALREQ), as illustrated, or a Registration Notification (REGNOT). The Qualification Request operation is generally used to request validation of the mobile station 16 and/or to request the

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subscriber profile for the mobile station 16. The Registration Notification operation, on the other hand, is generally used either (1) to validate the mobile station 16 or (2) to validate the mobile station 16 and obtain the subscriber profile for the mobile station 16. In accordance with ANSI-41 standards, several parameters are used for 5 each of these operations to, for example: identify the subscriber mobile station 16; identify the MSC 20; indicate the type of system access and the system's transaction capability; identify the information requested; and/or, provide other information as is known by those skilled in the art.

In accordance with the present invention, however, the HLR 28 stores a public 10 profile for the mobile station 16 for use in the PLMN 10 and a separate private profile for use in a DWOS 14. Accordingly, the Qualification Request or Registration Notification message 34 includes an additional Private Profile Request parameter that is used to identify which profile is requested. When the mobile station 16 is being served by a base station 18 in the PLMN 10, the request 34 that is sent to the HLR 28 15 includes a Private Profile Request parameter that specifically requests the public profile. Alternatively, if the Private Profile Request parameter is omitted or if no information is sent within the parameter, the HLR 28 might assume that the request 34 is for the public profile. In other words, sending the public profile might be the default response to the request 34. As will be appreciated, the default parameter might 20 instead be a selected private profile. Furthermore, the Private Profile Request parameter might also be used to request more than one profile. After receiving the request 34, the HLR 28 sends a response message 36, such as a Qualification Request Return (qualreq), as illustrated, or Registration Notification Return (regnot) message, via the signaling link 30. Other types of messages can also be used, such as a 25 standardized ANSI-41 Registration Cancellation or Qualification Directive. The response message 36 includes the requested profile information (i.e., one or more profiles) in a profile parameter and can, as is generally known in the art, also include other parameters containing additional subscriber or network information. Upon receipt of the response message 36, the VLR 26 stores the public profile (as indicated 30 at 38) for use by the serving MSC 20. In addition, the VLR 26 and/or the HLR 28 store an indication of which profile is currently being used by the mobile station 16.

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This permits the VLR 26 and/or the HLR 28 to provide appropriate responses to subsequent requests or other messages.

When the mobile station 16 moves from the PLMN 10 into a DWOS 14 (as indicated at 40) or when the mobile station 16 otherwise registers in a DWOS 14, the 5 DWOS's MSC 20 and its associated VLR 26 send a request 42 for subscriber information to the HLR 28 via a signaling link 30. The DWOS-originated request 42 is formatted in the same manner as the PLMN-originated request 34 in that it includes numerous parameters, including a Private Profile Request parameter. In contrast to the request message 34 used in the PLMN 10, however, the Private Profile Request 10 parameter of the DWOS-originated message 42 is encoded to indicate that the subscriber's private profile is needed. In response to the request message 42, the HLR 28 sends a response message 44 that includes the requested private profile. Again, this message is sent via a signaling link 30. Upon receipt of the response message 44, the VLR 26 stores the private profile (as indicated at 46) for use by the serving MSC 20 15 of the DWOS 14.

In an alternative embodiment, multiple public profiles and/or multiple private profiles can be stored in the HLR 28. Different profiles can then be requested depending on the location of the mobile station 16 within the PLMN 10 or depending on which DWOS 14 is currently serving the mobile station 16. For example, when the 20 mobile station 16 registers in the first DWOS 14(1), the serving exchange's VLR 26 might request a first private profile from the HLR 28. Subsequently, when the mobile station 16 moves into the second DWOS 14(2) (as indicated at 48), the new exchange's VLR 26 can request either the first private profile or a different private profile, depending on profile selection criteria that can be stored within the mobile station 16, 25 the MSC 20, or the VLR 26. As a result, the VLR 26 sends to the HLR 28 a request 42 containing a Private Profile Request parameter that identifies the appropriate profile. The HLR 28 then returns a response 44 that includes the requested private profile.

In the preferred embodiment described above, all of the subscriber's public and 30 private profiles are stored, as private parameters, in a public service provider's HLR 28. Thus, the HLR 28 acts as a centralized database for storing the subscriber's public and private profiles. These profiles can then be requested and provided through the

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use of standardized protocols or in accordance with an agreement between the service provider for the public system 10 and the service provider for the DWOS 14. In this embodiment, the implementation of the present invention would preferably be accompanied by an expansion in the capacity of the ANSI-41 messages to make additional room for the added parameters or by the creation of specific messages specifically for requesting a certain selected profile or profiles.

In an alternative embodiment, the private profile or profiles are stored as private parameters in a "home" DWOS's HLR 50. In this alternative, instead of sending PLMN-originated request messages 34 and DWOS-originated request messages 42 to an HLR 28 in the PLMN 10, the requests 34 and 42 are formatted as "private" ANSI-41 messages and are routed to the DWOS HLR 50. The DWOS HLR 50 then responds by sending the appropriate profile information.

In yet another embodiment, the private profile is stored in a "home" DWOS 14(1). When the mobile station 16 registers in a visited DWOS 14(2), the visited DWOS 14(2) requests the appropriate private profile directly from the home DWOS 14(1), via a DWOS interconnection 62, instead of requesting the profile from the subscriber's HLR 28 in the PLMN 10. Accordingly, the requested profile is provided to the visited DWOS 14(2) via private messaging between the home DWOS 14(1) and the visited DWOS 14(2).

Referring now to FIGURE 2, there is shown a flow diagram illustrating the operation and signaling of the telecommunications system 2 of the present invention. When the mobile station 16 first enters an area that is served by a visited exchange (or is first turned on within such an area), the mobile station 16 transmits a registration signal 80 to a nearby, serving base station 18, which in turn forwards the registration signal 80 to the MSC 20. Upon receipt of the registration signal 80, the MSC 20 sends a message 82, such as a Registration Notification, to the VLR 26 of the serving system. This message includes a request for either a public or private profile. The MSC 20 can also send the message 82 (a Qualification Request, in this case) in response to other events, such as a call origination from the mobile station 16 or a call set-up request directed toward the mobile station 16. The Private Profile Request parameter is included in the message 82 when the mobile station 16 or the MSC 20 is used to select the appropriate profile. In other cases (i.e., when the appropriate profile

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is identified at the VLR 26), the message 82 does not include data in the Private Profile Request parameter. In other words, the Private Profile Request parameter is omitted from the message 82 (or is empty) when the message 82 is transmitted from the MSC 20 to the VLR 26. Rather, the VLR 26 generates a second message 84 by  
5 adding the Private Profile Request parameter to the information in the message 82.

Thus, in response to the message 82, the VLR 26 identifies an appropriate profile, if necessary, and sends a second message 84 including the Private Profile Request parameter to the mobile station's HLR 28. The HLR 28 responds with a Qualification Request Return message or another appropriate return message 86, that  
10 includes the requested profile information, along with any other parameters that may be necessary. The profile information is stored in the VLR 26 and is supplied to the MSC 20 via a response signal 88. Subsequently, the VLR 26 provides the stored profile data to the MSC 20 as needed. Thus, once the profile information is stored in  
15 the VLR 26, the VLR 26 can immediately respond (i.e., with a response signal 88) to any subsequent profile request messages 82 without having to retrieve the information from the HLR 28.

The Private Profile Request parameter that is used to specify which profile is needed is preferably defined according to a standardized format. For example, consistent with existing ANSI-41 protocols, the parameter can include one or more  
20 binary-encoded octets that are reserved for carrying information about a requested profile. In one embodiment, a first octet of the Private Profile Request parameter is encoded with a number that identifies the desired private profile. Subsequent octets, if available, can then be used to encode other information about the profile request. In an alternative embodiment, the first octet is used solely for requests that relate to  
25 the public profile. For example, a binary value of one for the least significant bit indicates that a validation of the public profile is requested, while a binary value of one for the next least significant bit signifies a request that the HLR 28 send the private profile. Subsequent octets can be used for identifying a requested private profile by its unique identifier. In yet another alternative, the request for a private profile can be  
30 encoded in a parameter that is defined in existing protocols. For example, the ANSI-41 Qualification Information Code parameter, which is currently used to specify whether the serving exchange wants the HLR 28 to validate the profile and/or to send

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a particular subscriber profile, can be modified to allow a designation of the requested profile.

Although preferred embodiments of the method and apparatus of the present invention have been illustrated in the accompanying Drawings and described in the foregoing Detailed Description, it is understood that the invention is not limited to the embodiments disclosed, but is capable of numerous rearrangements, modifications, and substitutions without departing from the spirit of the invention as set forth and defined by the following claims.

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WHAT IS CLAIMED IS:

1. A method for retrieving subscriber profile data, comprising the steps of:
  - detecting a mobile station in a serving network;
  - selecting at least one of a plurality of subscriber profiles associated with the detected mobile station for use in the serving network, wherein the at least one selected subscriber profile is associated with the serving network; and
  - retrieving the at least one selected subscriber profile.
2. The method of claim 1 wherein the at least one selected subscriber profile is retrieved from a node in a remote network associated with the mobile station.
3. The method of claim 2 wherein said node comprises a home location register.
4. The method of claim 2 wherein said serving network comprises a digital wireless office system.
- 15 5. The method of claim 2 wherein said remote network comprises a public land mobile network.
6. The method of claim 1 further comprising the step of storing the at least one retrieved subscriber profile in the serving network.
- 20 7. The method of claim 1 wherein the at least one retrieved selected subscriber profile comprises a certain one of the plurality of subscriber profiles whose characteristics correspond to the characteristics of the serving exchange.
8. The method of claim 2 wherein the step of retrieving the at least one selected subscriber profile comprises the step of sending a request to a database node, said request identifying the selected subscriber profile.

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9. The method of claim 8 wherein said request comprises a registration notification message.

10. The method of claim 8 wherein said request comprises a qualification request message.

5 11. The method of claim 8 wherein said request includes a designated parameter for identifying the at least one selected subscriber profile.

12. A mobile telecommunications system, comprising:  
a home network storing a plurality of subscriber profiles for a single particular mobile subscriber; and

10 a serving network currently serving the mobile subscriber, said serving network sending a request to the home network to return at least one selected subscriber profile of said plurality of subscriber profiles, wherein the home network retrieves the at least one selected subscriber profile in response to the request and transmits the at least one retrieved subscriber profile to the serving network, the at 15 least one selected subscriber profile associated with the serving network.

13. The system of claim 12 wherein said request comprises a registration notification message.

14. The system of claim 12 wherein said request comprises a qualification request message.

20 15. The system of claim 12 wherein the serving network comprises a private network.

16. The system of claim 15 wherein the home network comprises a public land mobile network.

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17. The system of claim 12 wherein the serving network comprises a public land mobile network.

18. The system of claim 17 wherein the home network comprises a private network.

5 19. The system of claim 12 wherein the serving network includes a visitor location register (VLR), said VLR sending a request to the home network.

20. The system of claim 19 wherein the home network includes a home location register (HLR), said HLR storing the plurality of subscriber profiles.

10 21. The system of claim 12 wherein the request includes a parameter specified for identifying the at least one selected subscriber profile.

22. A telecommunications node comprising a register for storing a plurality of subscriber profiles for a single particular mobile subscriber, said register operating to:

15 receiving a request message from a wireless network containing a parameter for specifying the at least one selected subscriber profile of the plurality of subscriber profiles to be used by a serving network;

retrieving the at least one selected subscriber profile from a memory in response to the request; and

20 sending the at least one retrieved subscriber profile to the requesting node in the wireless network.

23. The telecommunications node of claim 22 wherein the requesting wireless network comprises a digital wireless office system and the at least one selected subscriber profile comprises a private subscriber profile specifically tailored for use in that digital wireless office.

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24. The telecommunications node of claim 22 wherein the register further operates to extract an identification of the at least one selected subscriber profile from a preassigned portion of said request.

25. The telecommunications node of claim 22 wherein said register  
5 comprises a home location register.

26. The telecommunications node of claim 22 wherein said register is located in a private network.

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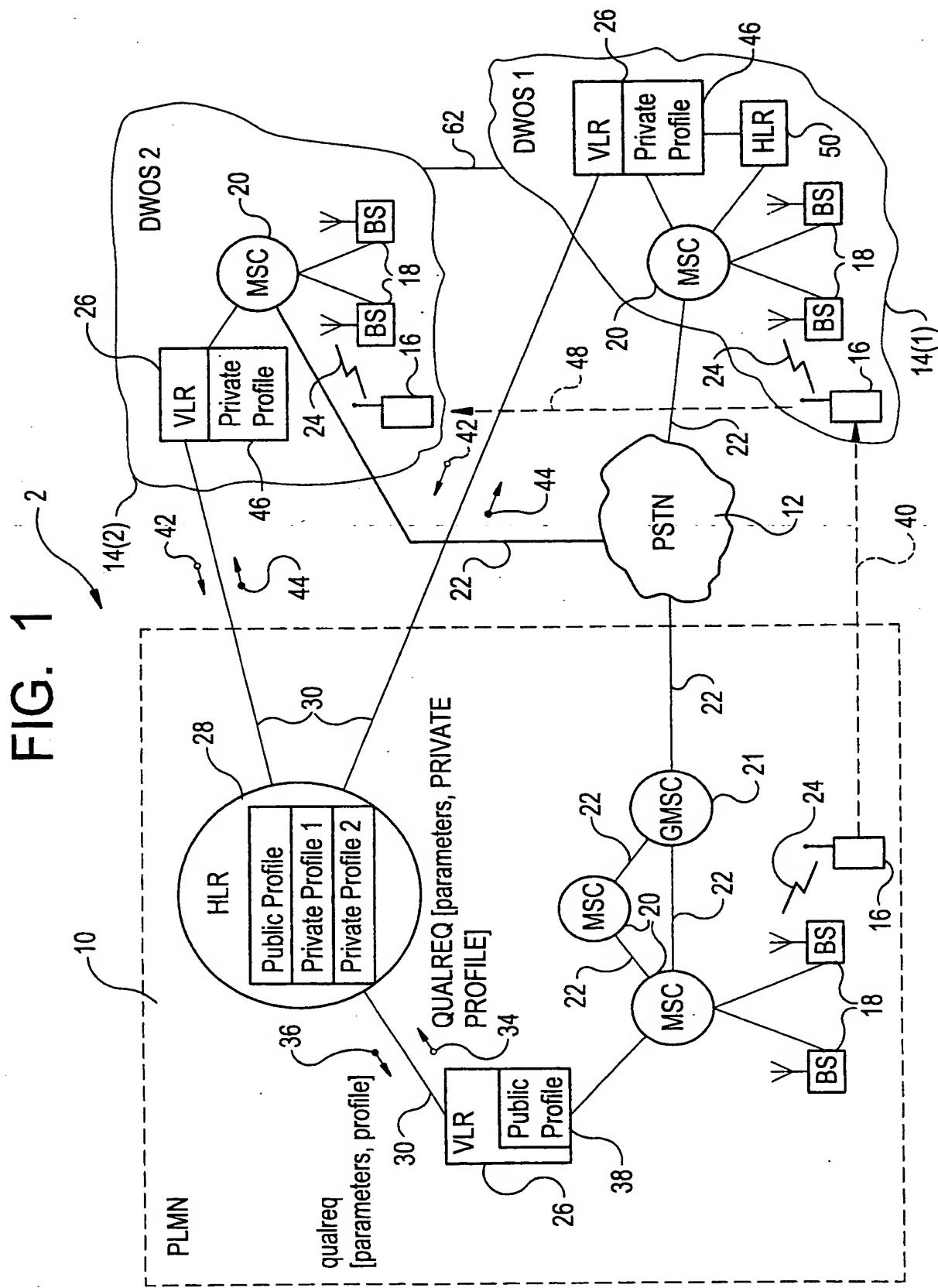
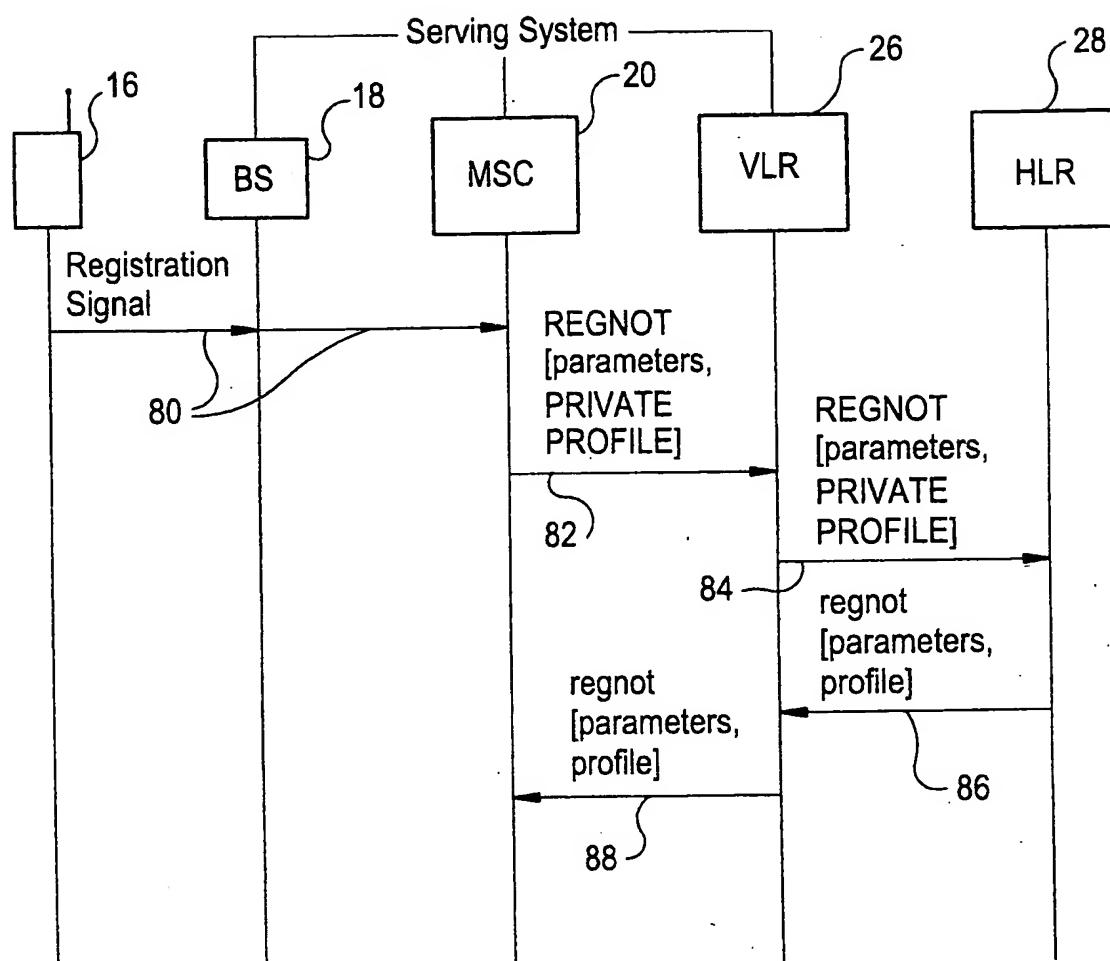


FIG. 2



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